Oak Decline and the Decline of Oak Forests

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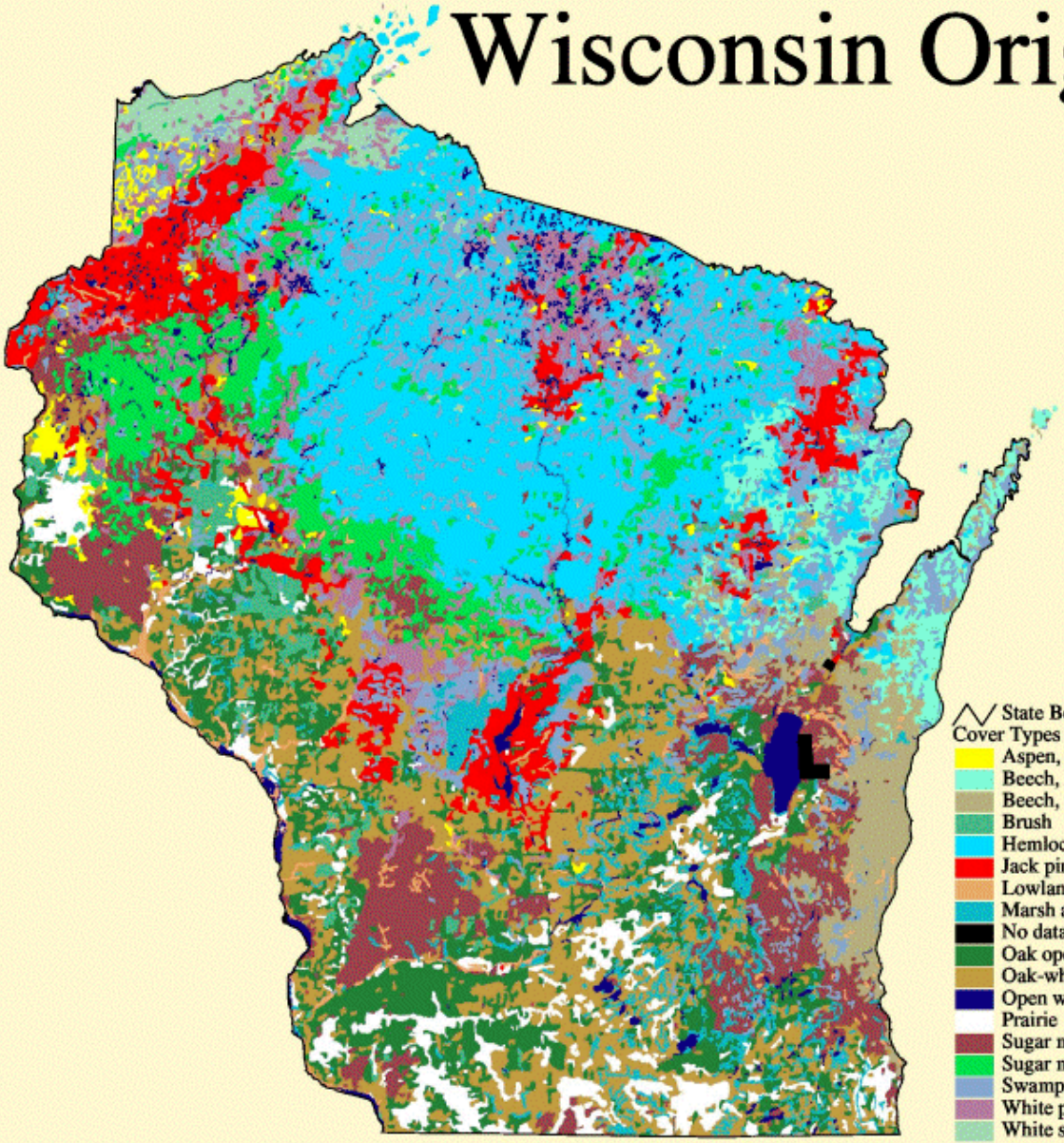
Wisconsin Original Vegetation



N
W E
S

Scale
1:3300000

Miles
0 20 40 60 80

State Boundary

Cover Types

- Aspen, white birch, pine
- Beech, hemlock, sugar maple, yellow birch, white pine, red pine
- Beech, sugar maple, basswood, red oak, white oak, black oak
- Brush
- Hemlock, sugar maple, yellow birch, white pine, red pine
- Jack pine, scrub (hill's) oak forests and barrens
- Lowland hardwoods-willow, soft maple, box elder, ash, elm, cottonwood, river bir
- Marsh and sedge meadow, wet prairie, lowland shrubs
- No data or unknown
- Oak openings-bur oak, white oak, black oak
- Oak-white oak, black oak, bur oak
- Open water
- Prairie
- Sugar maple, basswood, red oak, white oak, black oak
- Sugar maple, yellow birch, white pine, red pine
- Swamp conifers-white cedar, black spruce, tamarack, hemlock
- White pine, red pine
- White spruce, balsam fir, tamarack, white cedar, white birch, aspen

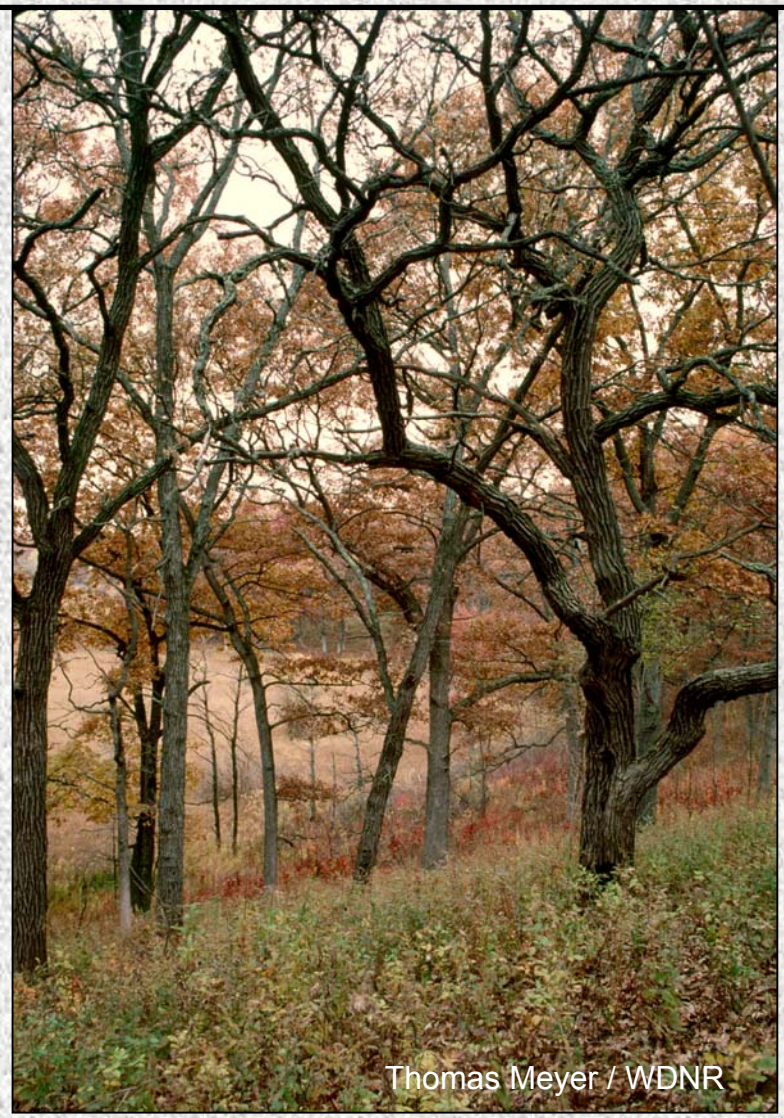
Vegetative cover map derived from General Land Office notes and maps from the original land survey covered in Wisconsin (1832-1866). Map was digitized by the Wisconsin DNR

Great Lakes Ecological Assessment

Historic land cover of southern Wisconsin: oak openings and oak forest

The historic dominance of oaks in southern Wisconsin:

- Dry and warm climate during the Holocene.
- Periodic fires, including those started by Native Americans.
- Repeated cutting followed by fire after Euro-American settlement.



Many species depend on oak

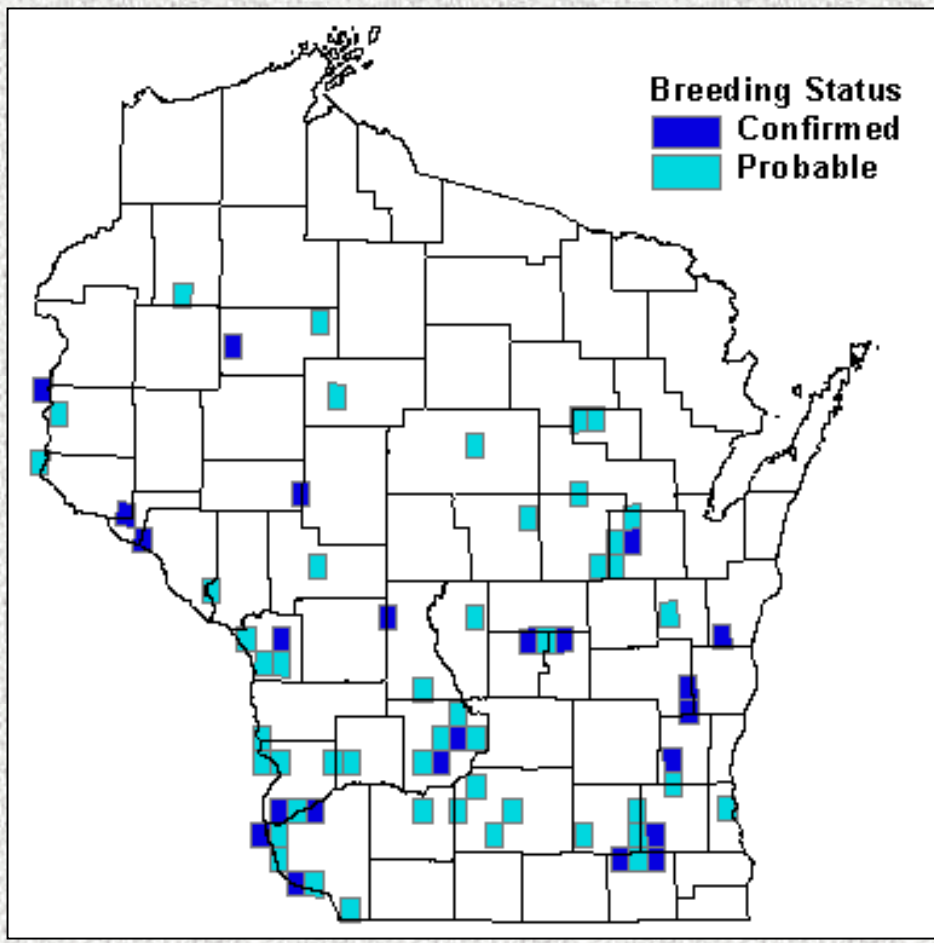
Cerulean Warbler

Photo by Paul Wray, Iowa State Univ.

- Mast lasts through winter, but does not have a hard shell. Many species can utilize it; there is not a replacement.
- Over 90 North American vertebrates use acorns.
- Leaf structure provides foraging opportunities for insectivorous birds (short petiole, more rigid leaf surface).
- Rougher bark as compared with maples provides more surface area for foraging and greater numbers of arthropods.

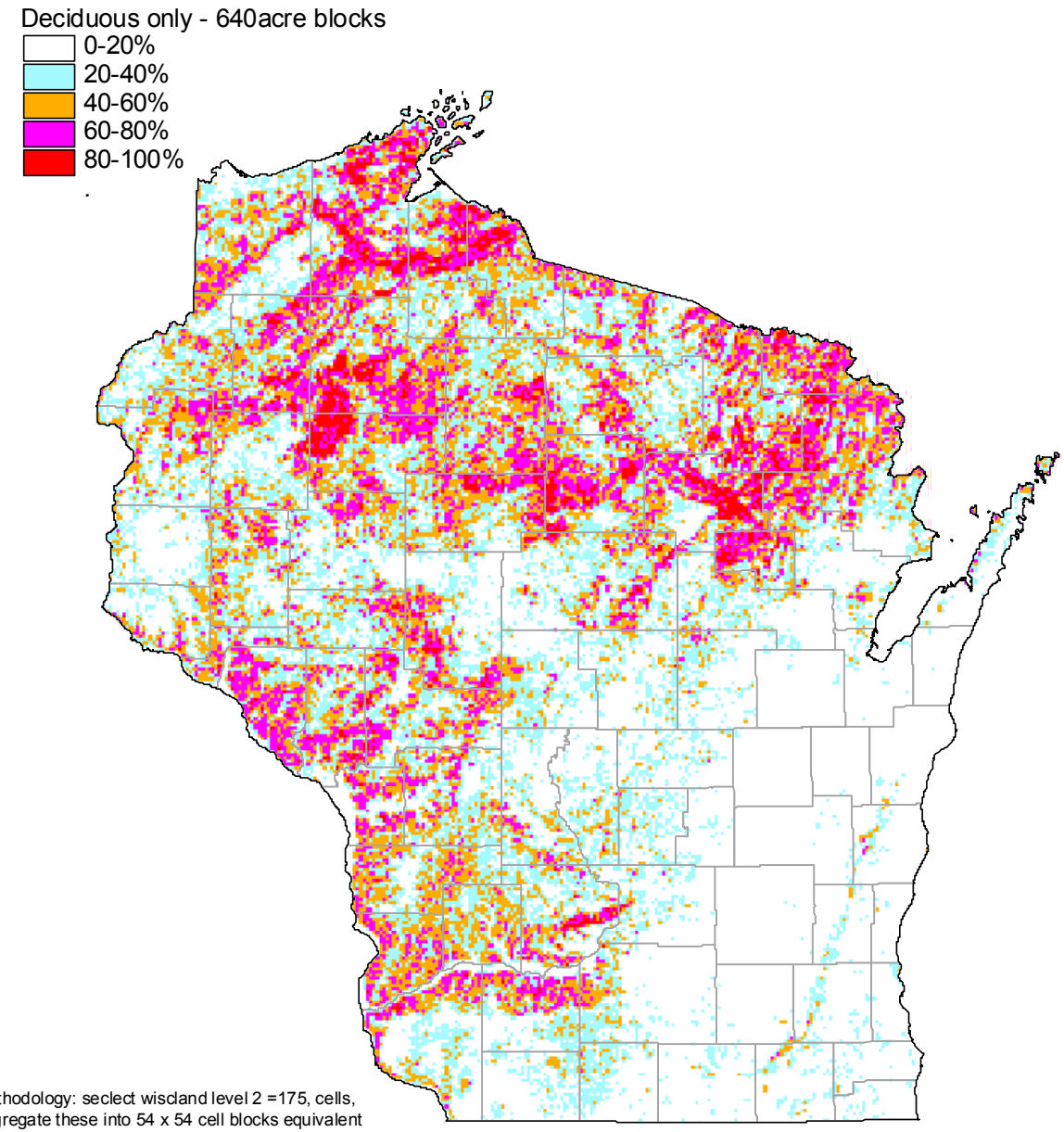
Cerulean Warbler habitat features

- Older forests (unclear whether old age is important in addition to supporting trees of large stature and girth).
- Deciduous trees.
- Southern Wisconsin location (fewer occurrences north of the Tension Zone).
- Large patch sizes (minimum size estimates between 40 and 4,000 acres; preferred proportion of young forest vs. old forest within the patch is unknown).
- Large-diameter trees within a stand (20" minimum).
- Low cowbird abundance.



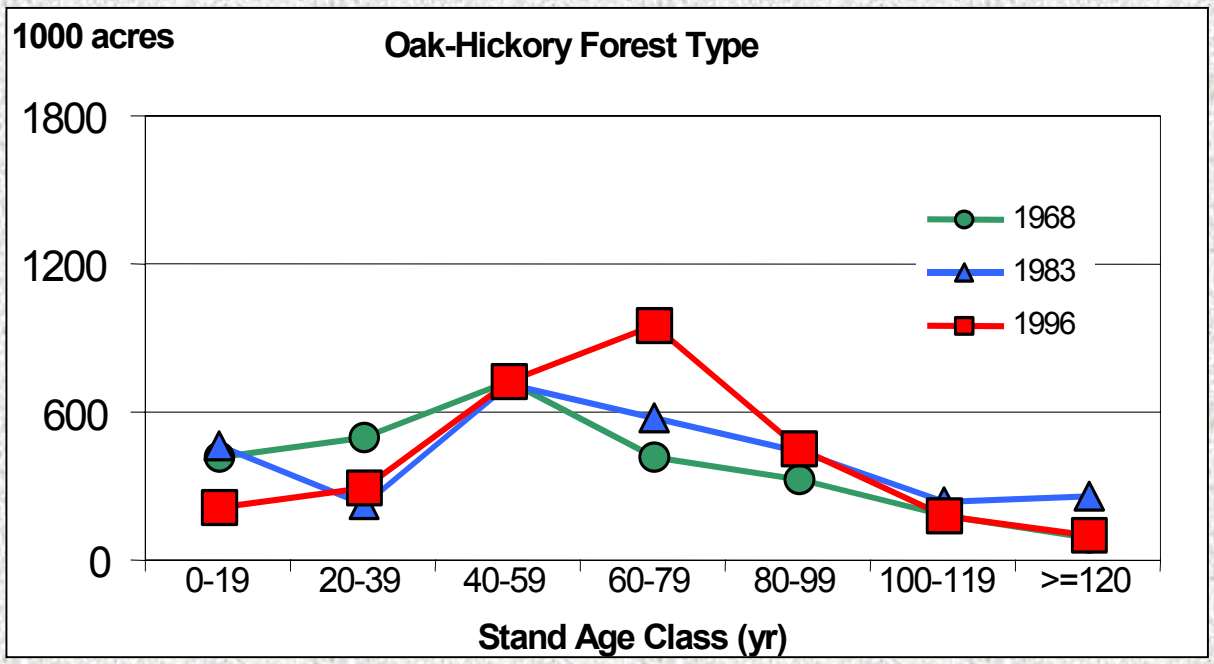
Cerulean Warbler known occurrences in Wisconsin, from the Breeding Bird Atlas project. http://www.uwgb.edu/birds/wbba/species/maps/CERW.htm

Deciduous forest blocks, from WISCLAND land use/land cover data

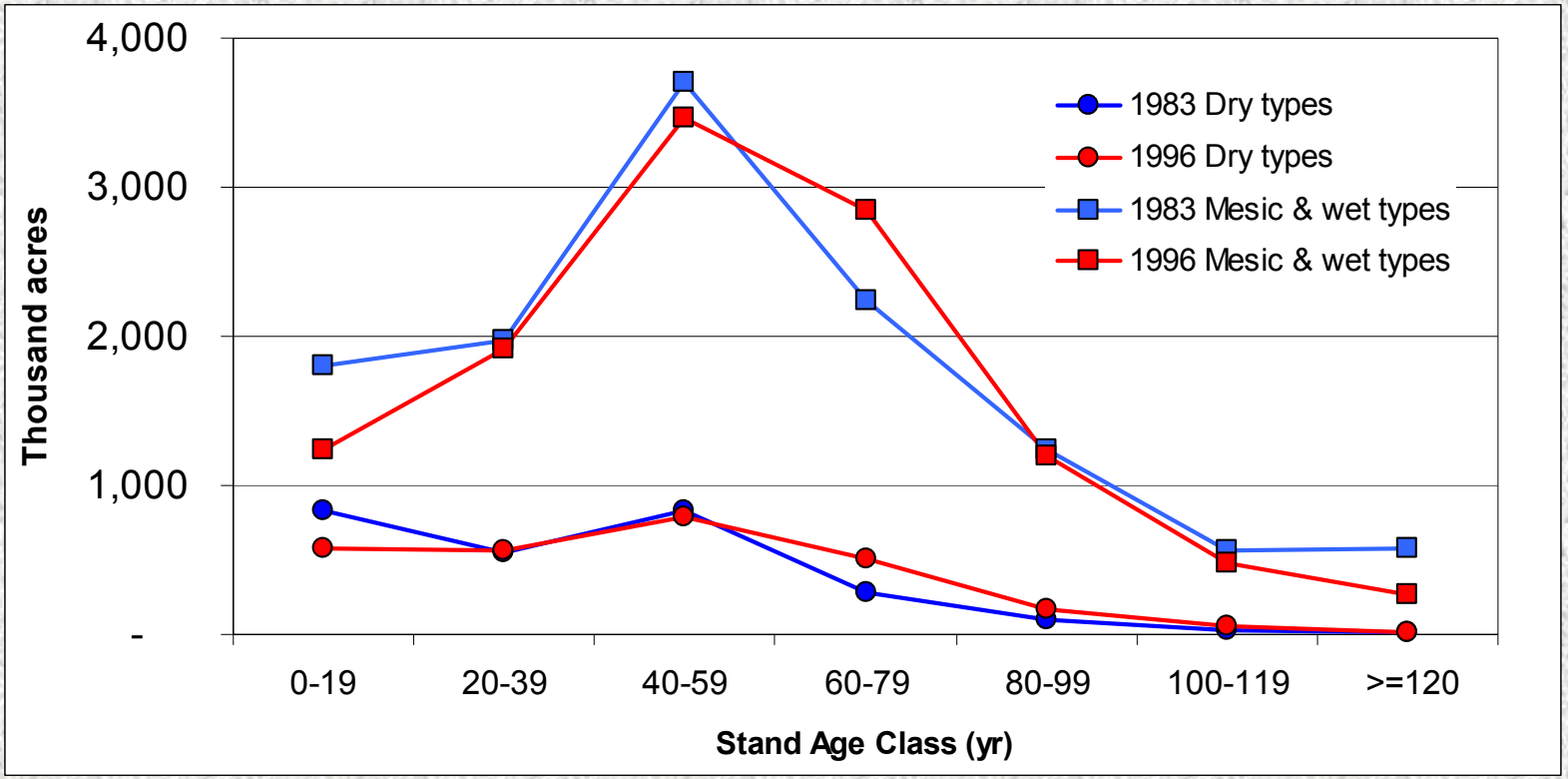


Methodology: seclect wiscland level 2 =175, cells, aggregate these into 54 x 54 cell blocks equivalent to 640 acres, each block with a value equalling the average percentage of type 175 in that block based on the 30 m cells.

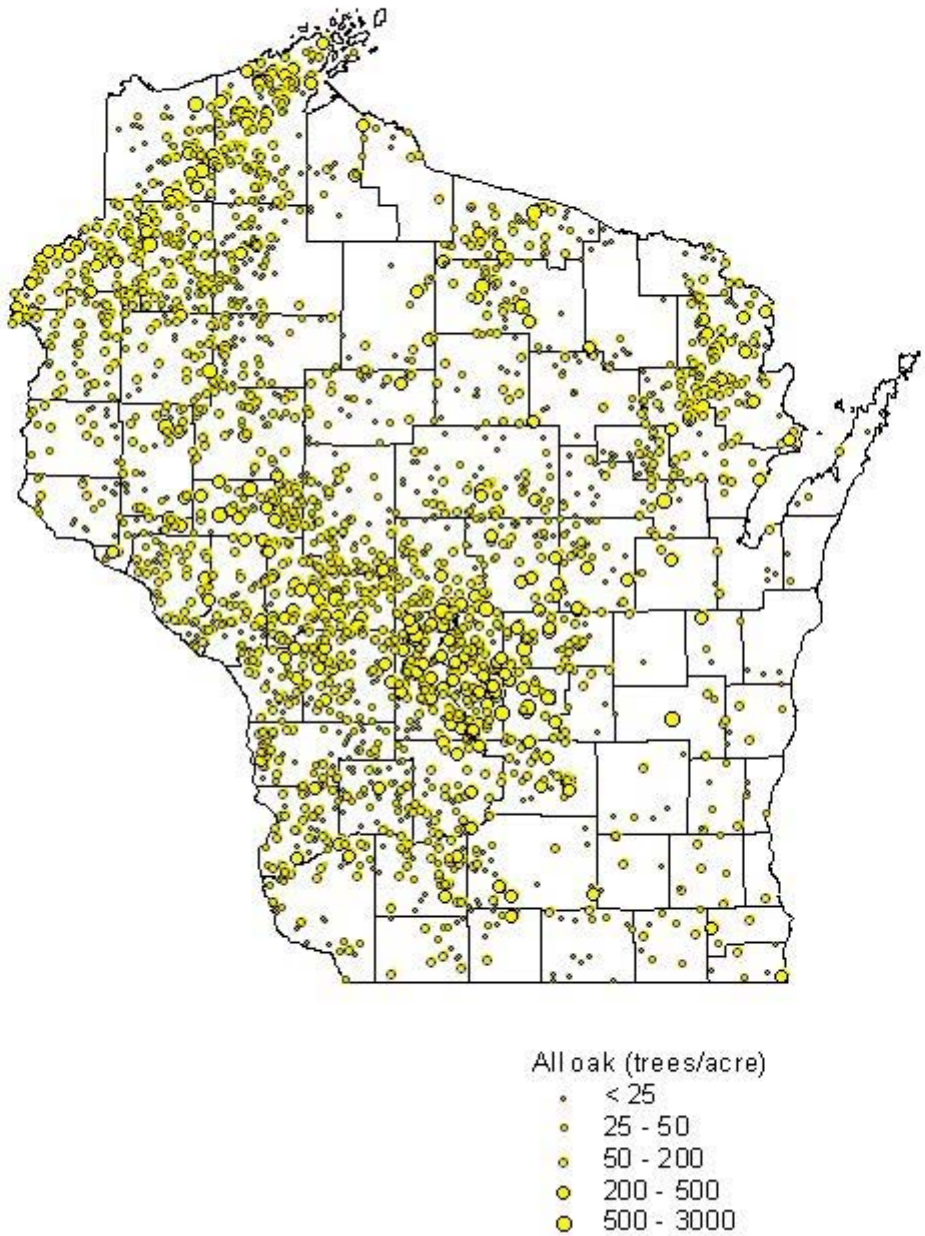
Age-class distribution of the oak-hickory forest type group in the past three FIA inventories



Oak-hickory forest age-class distribution by Habitat Type group in Wisconsin. Dry oak forests are less abundant overall, and there is little acreage in age-classes 100 years and older.

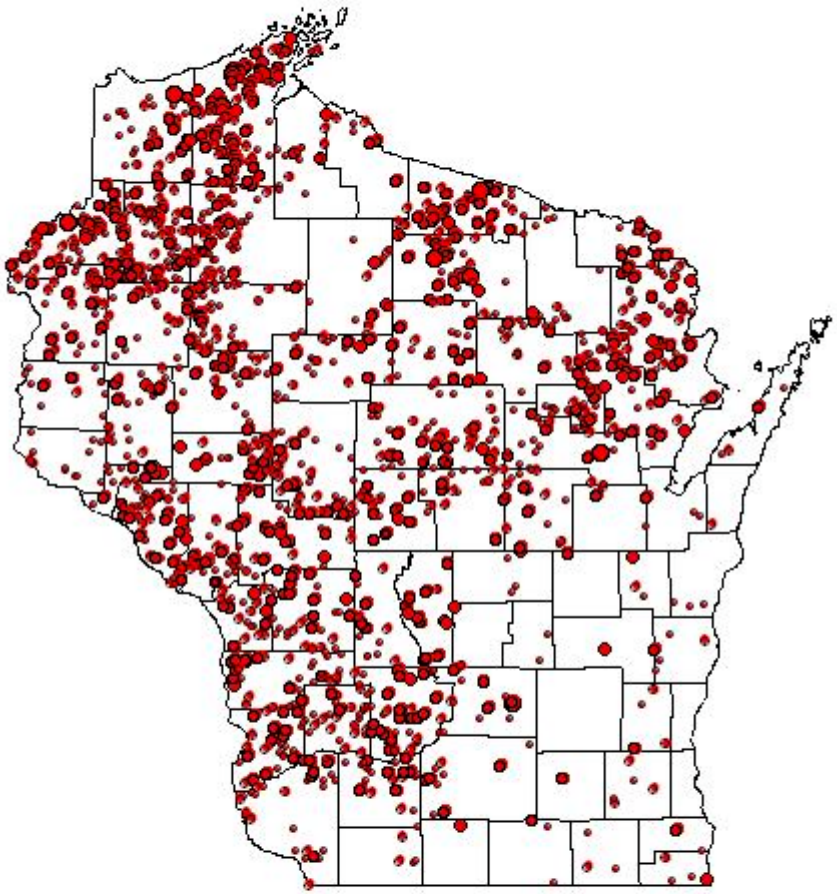


Density of all oaks at FIA plots in 1996

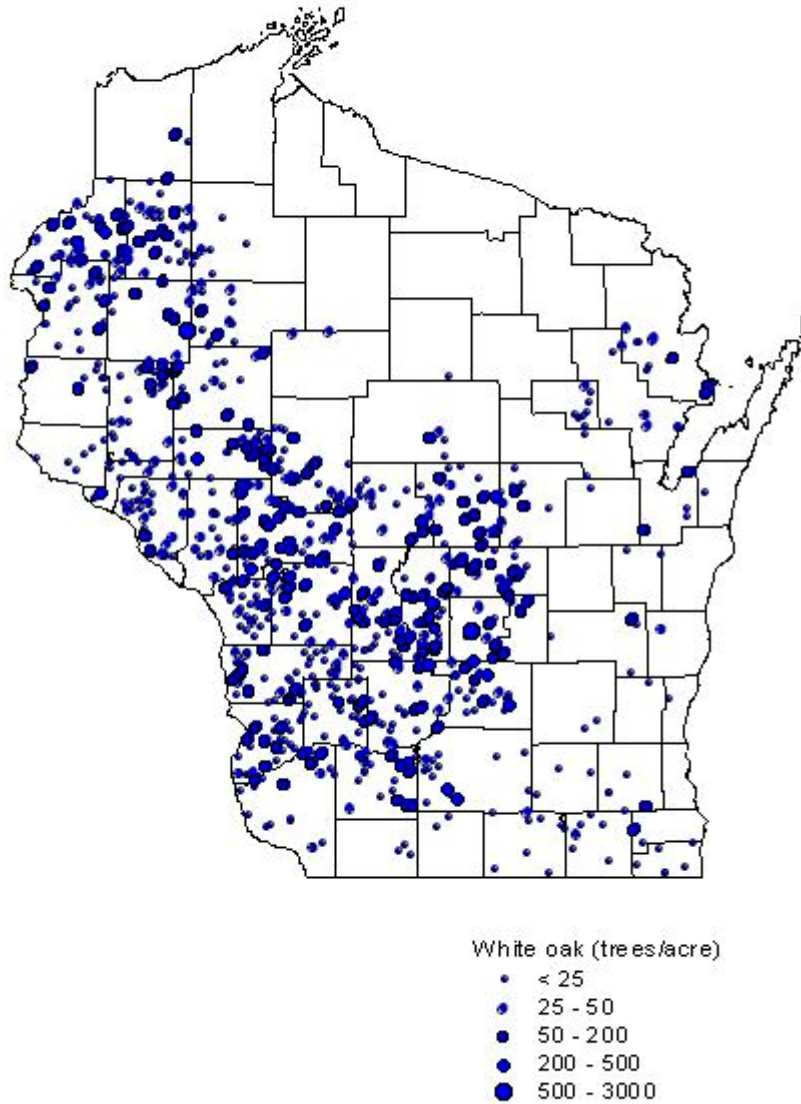


Growing stock over 1" dbh

Red oak

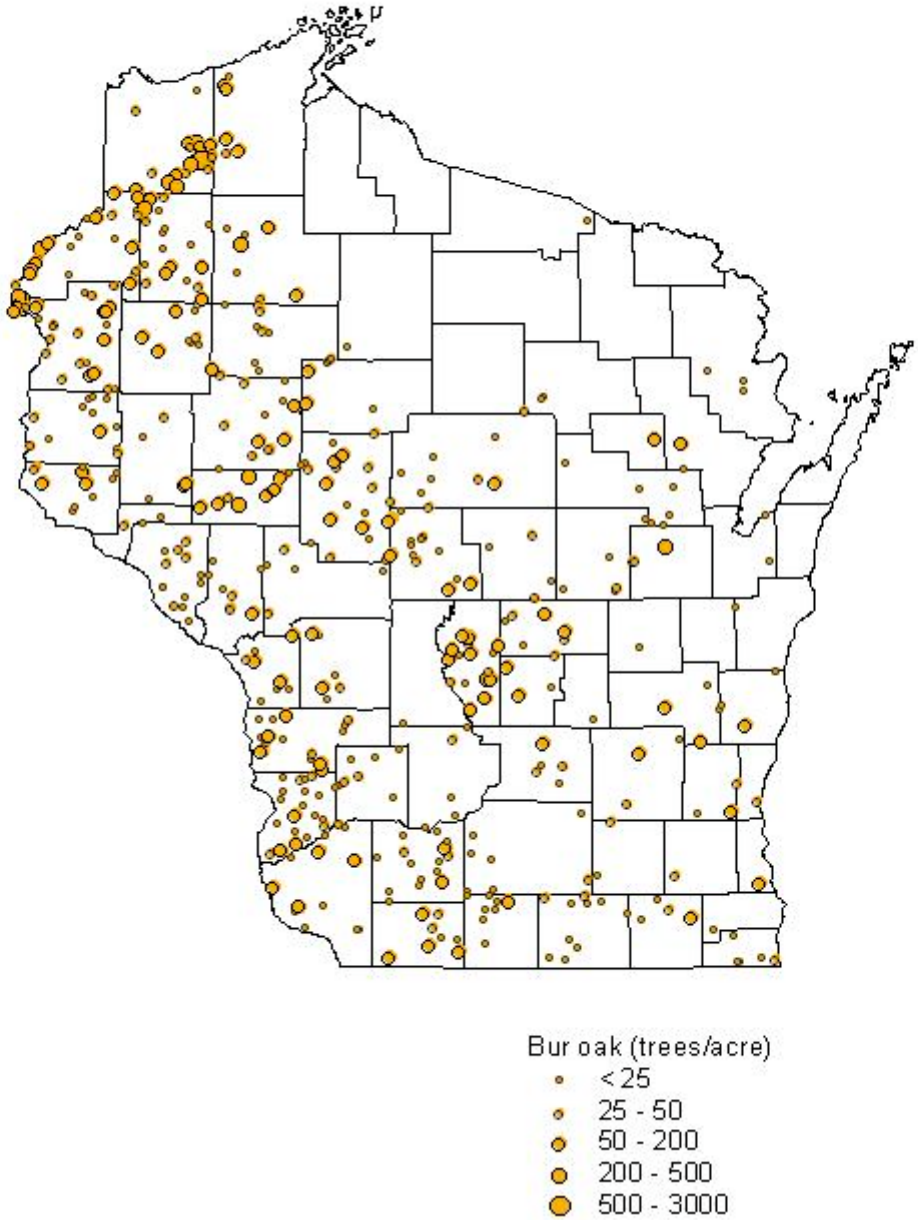


White oak



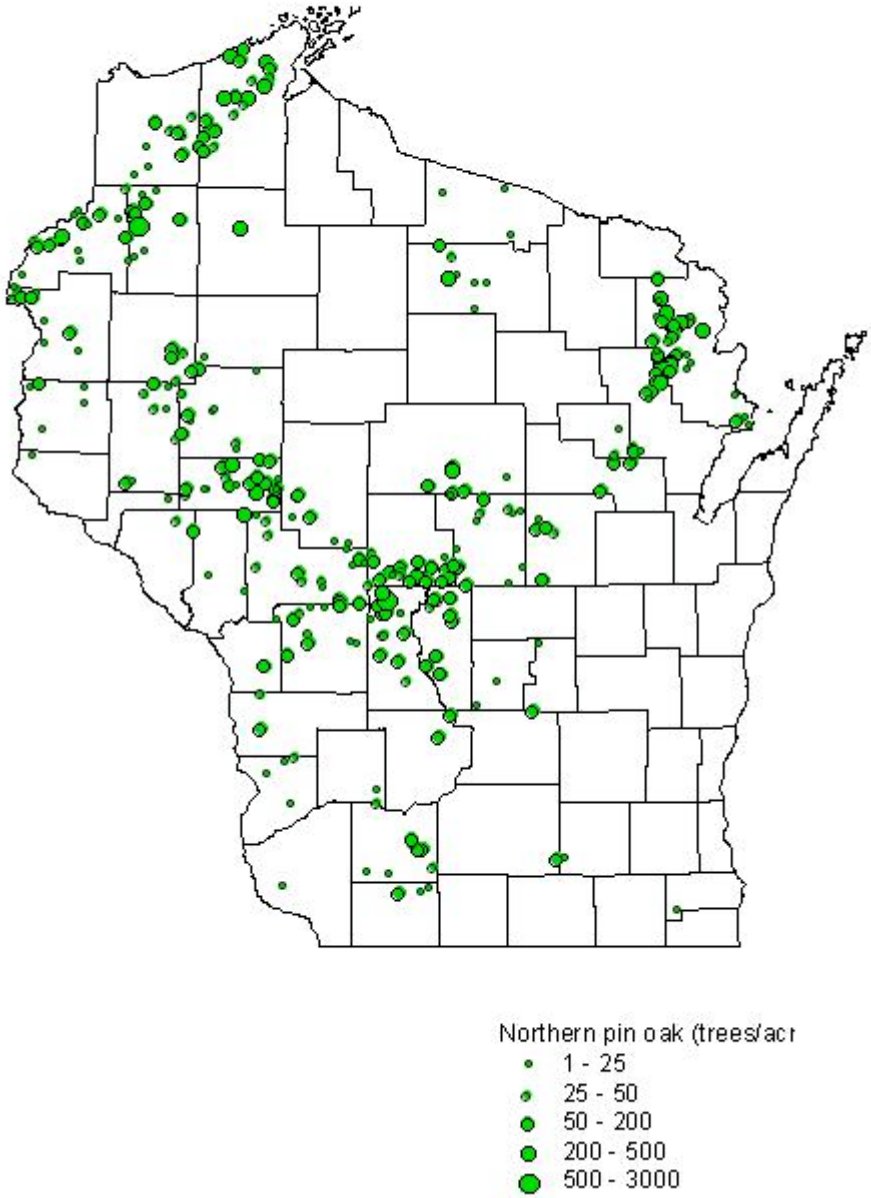
Growing stock over 1" dbh

Bur oak

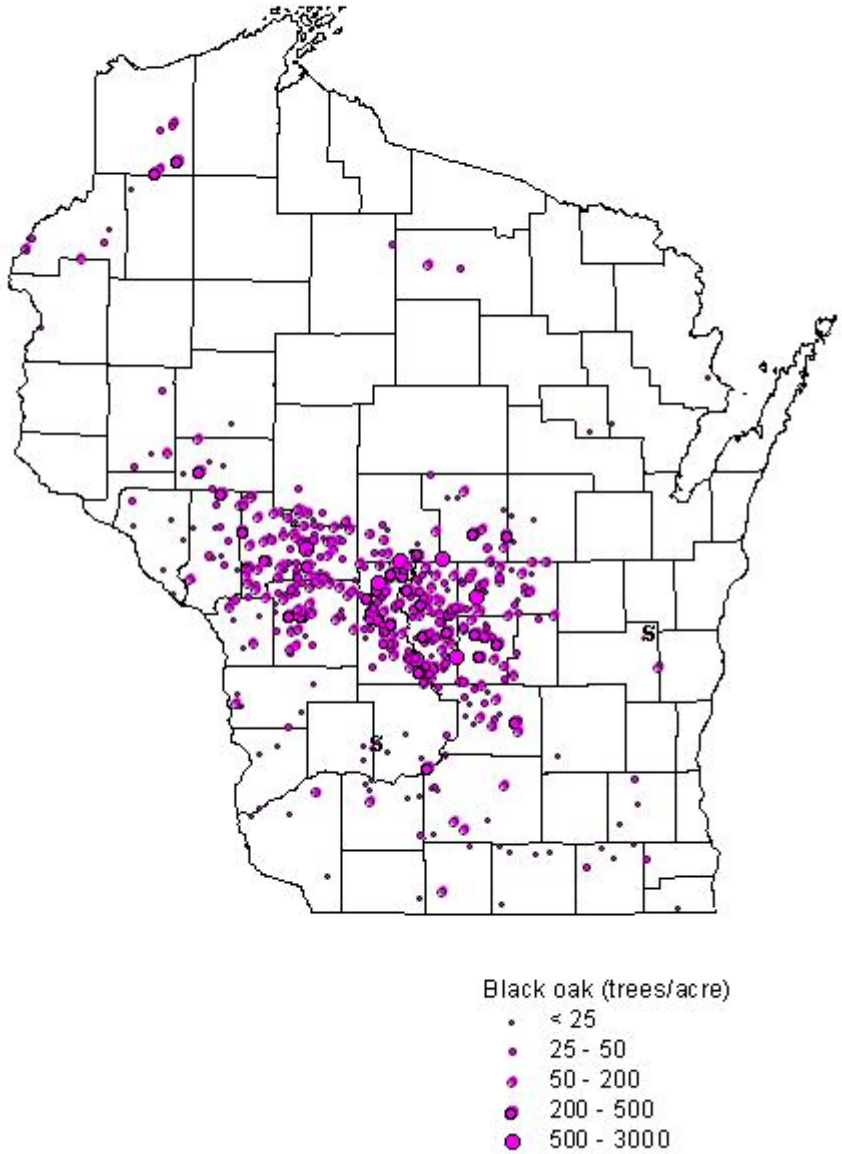


Growing stock over 1" dbh

Northern pin oak



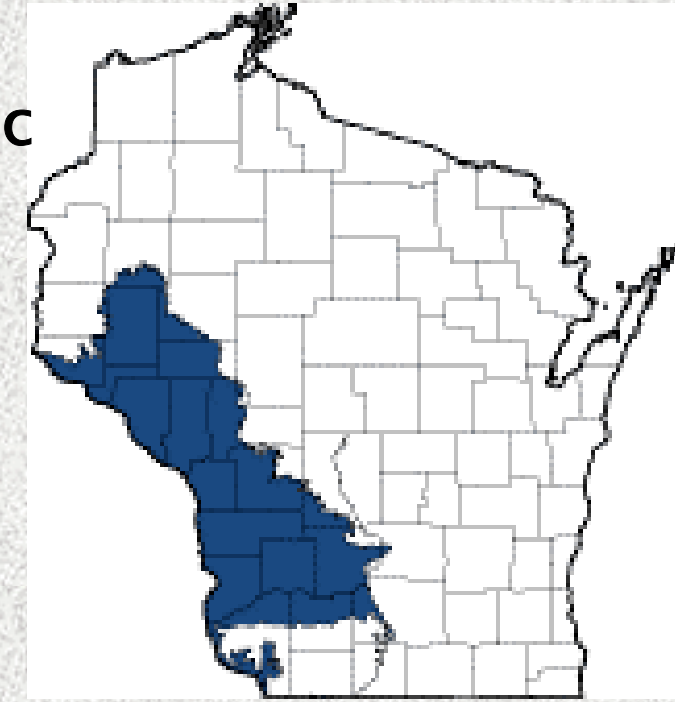
Black oak



Removal and mortality of oak is very high in southwest Wisconsin

FIA data for1983 and 1996

- Statewide, net annual growth of select red oaks was 43.9 million cubic feet; 53.4 million cubic feet were removed.
- For select white oaks,16.7 million cubic feet grew;18.7 million cubic feet were removed.
- The Ecological Landscape most drastically affected is the Western Coulees and Ridges; 22.0 million cubic feet of all oak species were produced. Almost twice that – 42.4 million cubic feet – were removed.



The Western Coulees and Ridges Ecological Landscape

Competitiveness of Central Hardwoods

Changes in disturbance regimes during the 1900's have facilitated conversion to shade-tolerant tree species.

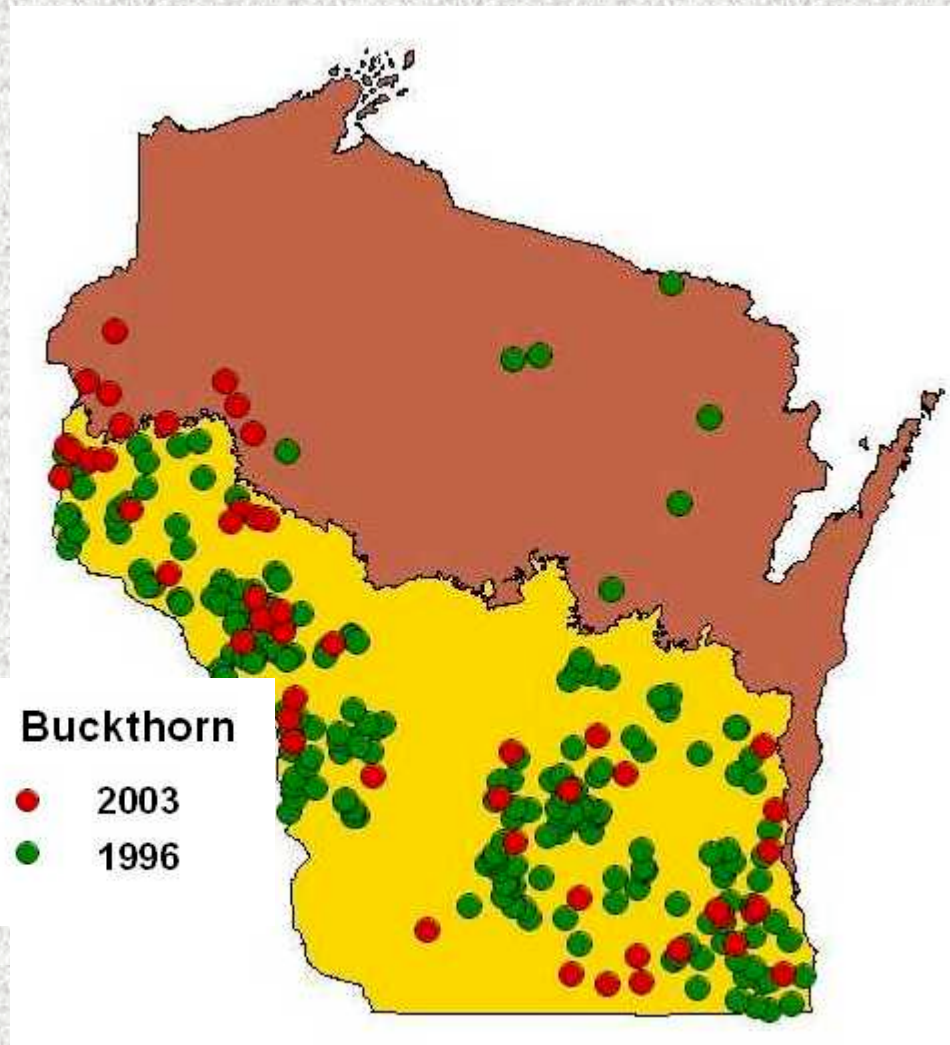
- Fire suppression.
- Reduction in even-aged forest management practices.
- Heavy deer browsing.
- Invasive shrubs.

Common Buckthorn

Identified at Forest Inventory and Analysis Plots

Buckthorn is found primarily in southern Wisconsin, where it infests over 11% of timberland.

Forest managers are working to remove buckthorn at selected sites to allow oak regeneration.



Foresters are trying a variety of methods to regenerate forests infested with invasive plants.

- Brush removal (mechanical)
- Spraying
- Scarification
- Planting
- Layering
- Tree shelters
- Conversion
- Prescribed burning

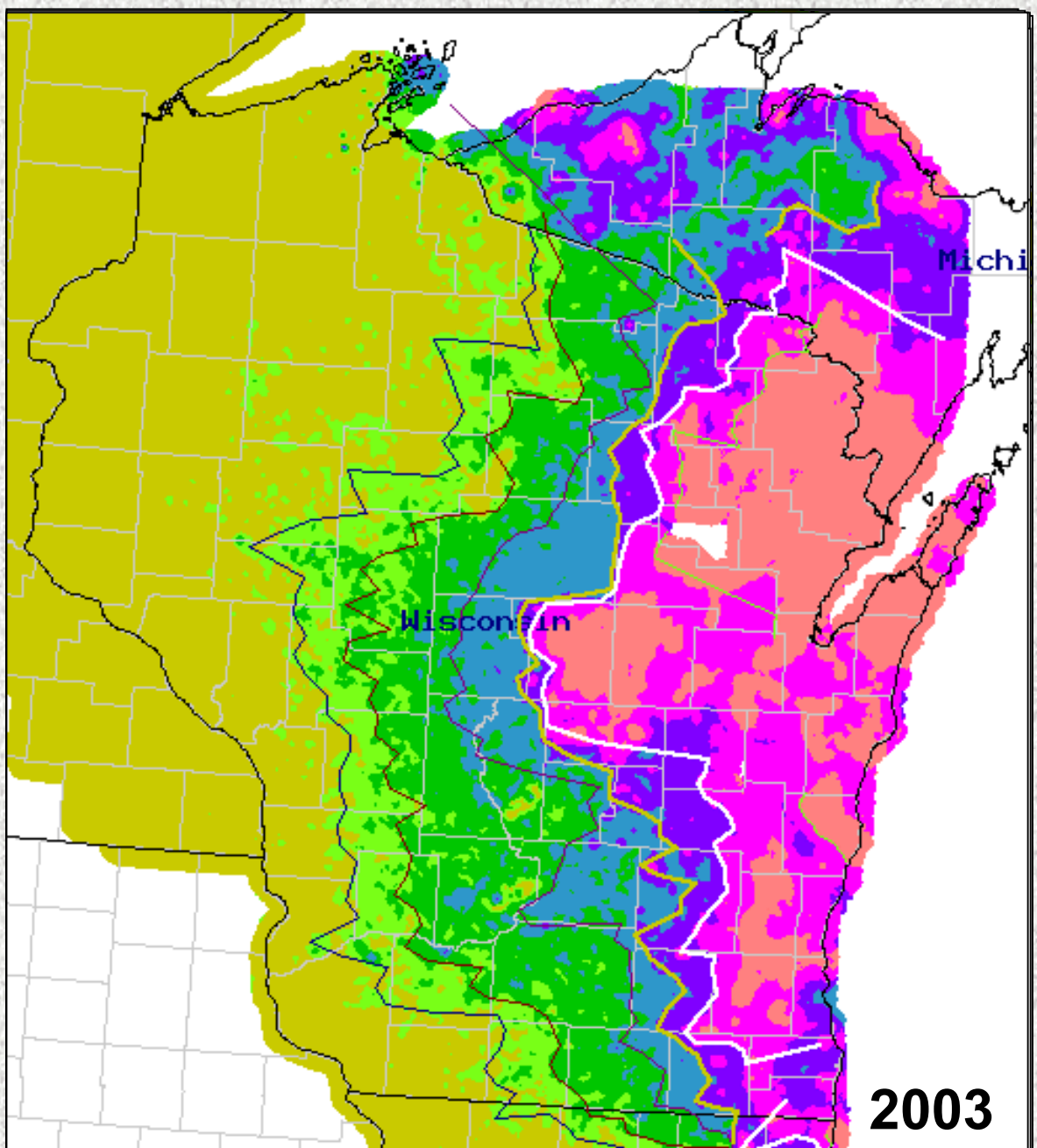
These treatments increase costs.

Oak Decline
Reduction in vigor

- Drought, frost.
- *Armillaria* root disease.
- Two-lined Chestnut Borer.
- Gypsy moth.
- Oak wilt.

Photo by D.W. French, University of Minnesota

Gypsy moth expansion



Trap catch data from http://da.ento.vt.edu/

Summary

- Oak forests and oak openings are greatly reduced from their historic extent.
- Oak is critically important to many species.
- Oak species are threatened by many forest pests.
- Oaks are being harvested at a rapid rate in southwest Wisconsin.
- Oak is difficult to regenerate.
- These factors make sustainability of oak forests questionable.